

REMARKS

As an initial matter, Applicants point out there are numerous inconsistencies in the Examiner's restriction requirement set forth in the Office Action dated January 29, 2002. For example, claim 38 depends upon claim 8 and belongs in Group II, not Group I. Claim 37 depends upon claim 1 and belongs in Group I, not Group II. Claims 37 and 38 each recite that the circuit-connecting material of claims 1 and 8, respectively, "contains an acrylic rubber;" therefore, there is no reason to justify classifying claims 1 and 38 together and claims 8 and 37 together. Claim 34 depends upon claim 1 and belongs in Group I and should not be grouped in Group II as the Examiner now suggests (Office Action, dated June 18, 2002, page 2, lines 9-11). Claim 40 depends upon claim 1 and clearly belongs in Group I. Claim 40 is drawn to a "circuit-connecting material" and has nothing to do with a method of making a circuit as the Examiner suggests. Likewise, claims 41 and 42 are directed to "circuit-connecting material" and have nothing to do with a method of making a circuit as the Examiner suggests.

The Examiner's restriction requirement is so replete with the kind of errors described above as to lend to the appearance that claims have been assigned to groupings at random. For this reason alone, Applicants traverse the restriction requirement and request that it be withdrawn.

Claim 1 had been amended to improve grammar and to particularly point out and distinctly claim that circuit-connecting material provides the structure to electrically connect facing electrodes "after curing by heat and pressure" as supported on page 38, line 19 to page 39, line 4, and page 42, lines 9-14, of the present specification.

No new matter has been added to the application by the present amendment.

The Invention

The present invention pertains broadly to circuit-connecting materials such as would be used to connect facing electrodes in an integrated circuit device. More specifically, in accordance with the

present invention a circuit-connecting material interposed between facing circuit electrodes electrically connects the electrodes in the pressing direction after curing by heat and pressure, wherein: the circuit-connecting material comprises the following essential components (1) to (3):

- (1) a curing agent capable of generating free radicals upon heating;
- (2) a hydroxyl-group-containing resin having a molecular weight of 10,000 or more; and
- (3) a radical-polymerizable substance.

Various other embodiments in accordance with the present invention are recited in the remaining dependent and independent claims. The main advantage in accordance with the present invention is that a circuit-connecting material is provided that has a superior low-temperature rapid curability and a long pot life.

The Rejections

Claims 1, 2, 24, 28-33, and 38 stand rejected under 35 U.S.C. 112, second paragraph, as indefinite. Claims 1, 24, 28, 29, 34 and 36 stand rejected under 35 U.S.C. 102(a) as anticipated by Japanese Document JP 11279511 (hereafter, the "JP'511 Document"). Claims 1, 24, 28, 29, 34 and 36 stand rejected under 35 U.S.C. 102(a) as anticipated by Japanese Document JP 11279513 (hereafter, the "JP'513 Document"). Claims 1, 28 and 36 stand rejected under 35 U.S.C. 103(a) as unpatentable over Japanese Document JP 50126054 A (hereafter, the "JP'054 Document").

Applicants respectfully traverse the rejection and request reconsideration for the following reasons.

Applicants' Arguments

As an initial matter, Applicant's point out that the present claims are in compliance with 35 U.S.C. 112 and are definite. First, the Examiner states that there is confusion as to how the circuit-connecting material can achieve an electrical connection when the material is "composed of essentially insulating components" (Office Action, dated June 18, 2002, page 2, lines 18-21). Applicant's specification teaches that the circuit-connecting material can be made without conductive particles and

still allow for enough direct contact between the electrodes after the pressing and curing to permit an electrical connection (specification, page 38, line 19 to page 39, line 4). The main function of the circuit-connecting material under these circumstances is to provide an adhesive that cures to hold the electrodes in sufficient direct contact to permit conduction, although some of the circuit-connecting material will remain disposed between the facing electrodes and may introduce some degree of unreliability. One skilled in the art would appreciate from the Applicants' disclosure that claim 1 is clear and definite because the "curing by heat and pressure" allows the circuit-connecting material to flow and set so as to create the electrical connection between the facing electrodes (specification, page 42, lines 9-14).

Claim 40 depends upon claim 1 and further recites that the circuit-connecting material contains conductive particles. In this material embodiment in accordance of the present invention, there is less of a need for direct contact between the facing electrodes because the material is more conductive and the electrical contact is improved and more reliable (specification, page 38, line 25 to page 39, line 22). However, the invention can be practiced without the use of conductive particles in the circuit-connecting material.

Applicants point out that claim 38 depends upon claim 8, which has not been canceled. Therefore, claim 38 is not indefinite. However, Applicants point out that claim 37 depends upon claim 1 and deserves to be assigned to Group I in place of claim 38.

As another initial matter, Applicants have submitted certified English translations of the following Japanese priority documents: (1) JP 09-079422, (2) JP 09-079424, and (3) JP 09-252933. The certified English translations are attached herewith. In accordance with 35 U.S.C. 119 and 37 C.F.R. 1.55, Applicants have met all of the requirements for establishing priority based upon these foreign documents. Specifically, Applicants have provided a certified copy of each of these documents, a certified English translation of each of these documents, and properly claimed priority to these documents in the declaration

filed with the present application. Thus, Applicants have properly established a priority date for the present invention dating back to 1997.

Applicants note that the effective date of the JP'511 Document is October 12, 1999, and that the effective date of the JP'513 Document is also October 12, 1999. In view of the Applicants' proper and complete claim to the right of priority established by the foreign priority documents, it is clear that the JP'511 Document and the JP'513 Document are not valid prior art references against the present claims. Consequently, all rejections relying upon either one of the JP'511 Document and the JP'513 Document must be withdrawn. Applicants assert that no further discussion of these moot references is necessary.

The JP'054 Document discloses a "heat-curable acrylic resin composition" that includes methacrylate, styrene and methacrylate derivatives (see English Abstract). The assignee is a paint company, which suggests that the disclosed composition is some sort of paint or coating. This is likely given that the composition includes a "liquid disperse agent" (see Title). The Examiner has not shown that the present reference discloses a heat-curable resin that is suitable for use in integrated circuits, much less as a circuit-connecting material as recited in claim 1. Furthermore, the reference does not teach, or even suggest, that a "circuit-connecting material" interposed to electrically connect facing electrodes "electrically connects the electrodes ... after curing by heat and pressure" as recited in claim 1.

New claim 50 has been added, which falls within the elected Group I. New claim 50 further contains the limitation of the "hydroxyl-group-containing resin having a molecular weight of more than 10,000". This limitation is supported by the original disclosure, where it states that the molecular weight is "10,000 or more" which phrase, by its literal terms includes both molecular weights of 10,000 "or" those with "more" than 10,000 molecular weight. In addition, all specific examples in the specification are more than 10,000 in molecular weight. This limitation takes the claim out of the scope of the prior art JP '054 disclosure which specifically teaches a powder acrylic resin having a number average molecular

weight of 3,000-10,000. Moreover, the reference specifically teaches against resins with more than 10,000 molecular weight. At p. 20, left bottom column, lines 4-10, the reference states “at over 10,000, acrylic resin acrylic resin particles remain stable in a dispersion agent, however, they do not melt easily during curing by heating, making it difficult to obtain a smooth painted surface.”

On the other hand, the high molecular weight of the present claim 50 has the advantage that the material is excellent in stress reduction which prevents problems that deteriorate the connection properties of an interconnect material such as crack generation, adhesiveness deterioration, and moisture increase. Further, combined with the large adhesiveness of the material of the present invention, the reduction in stress results in a synergistic effect, enhancing a reliable connection. Moreover, the present material can be used in the form of a film, which has significant advantages over the prior paste-type interconnect containing a solvent. The above merits of the claimed invention are neither disclosed nor suggested in the JP ‘054 reference, and would rebut any prima facie obviousness, even if such were established.

Conclusion

Applicants assert that the Restriction requirement is improper and should be withdrawn because the groupings are inconsistent and appear random. Applicants assert that the present claims are clear and definite when viewed in light of the specification. Lastly, Applicants have established that the JP’511 Document and the JP’513 Document are not valid prior art references against the present claims; therefore, all rejections relying upon either one of these references is untenable and must be withdrawn. Furthermore, Applicants argue that the resin composition disclosed by the JP-054 Document is from an unrelated field of endeavor, which does not teach or suggest a “circuit-connecting material” as recited in claim 1, or that such a material “electrically connects the electrodes ... after curing by heat and pressure” as also recited in claim 1. Specifically, the claim, as amended, requires the material to be disposed “between facing electrodes,” a limitation that is not remotely suggested by the reference. In addition, new

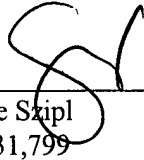
claim 50 recites a molecular weight range taught against by the reference, and thus novel and not obvious.

For these and all of the above reasons, claims 1, 2, 24, 28-34, 36, 37 and 38 are believed to be in condition for allowance and a prompt Notice of Allowance is earnestly solicited.

Questions are welcomed by the below-signed attorney for applicants.

Respectfully submitted,

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MARKED UP VERSION SHOWING CHANGES

1. (Amended) A circuit-connecting material ~~which is~~ interposed between facing circuit electrodes ~~facing each other and electrically connecting the electrodes in the pressing direction after curing by heat and pressure either by direct contact or via conductive particles present in the material by pressing the facing electrodes against each other~~, wherein:

the said circuit-connecting material comprises ~~as essential components~~ the following components (1) to (3):

- (1) a curing agent capable of generating free radicals upon heating;
- (2) a hydroxyl-group-containing resin having a molecular weight of 10,000 or more; and
- (3) a radical-polymerizable substance.

50. (New) A circuit-connecting material interposed between facing circuit electrodes electrically connecting the electrodes in the pressing direction after curing by heat and pressure either by direct contact or via conductive particles present in the material, wherein:

the circuit-connecting material comprises the following components (1) to (3):

- (1) a curing agent capable of generating free radicals upon heating;
- (2) a hydroxyl-group-containing resin having a molecular weight of more than 10,000; and
- (3) a radical-polymerizable substance.